USER REFERENCE MANUAL

FOR THE

LIMA 5000 SERIES MODEMS

DATA CODE

Issue C

USER REFERENCE MANUAL

FOR THE

LIMA 5000 SERIES MODEMS

NOTICE

The information contained in this publication is for use with the Lima 5000 Series Modems. Any reproduction of the whole, or part, of this publication is expressly prohibited without the written authorisation of Datacode Communications Ltd.

DATACODE Communications Limited
Automation House
Dun Laoghaire Industrial Estate
Pottery Road
Dun Laoghaire
Co. Dublin
Ireland

Telephone Dublin 840660

DATACODE Communications UK Limited
Doncastle House
Doncastle Road
Bracknell
Berks RG12 4PQ
England

Telephone 0344-868383

CONTENTS

1.0 INTRODUCTION TO THE LIMA 5000 SERIES MODEMS
- 1.1 FEATURES
- 1.2 MODES OF OPERATION

2.0 INDICATORS AND CONNECTIONS
- 2.1 THE FRONT PANEL INDICATORS
- 2.2 FRONT PANEL PUSH BUTTONS
- 2.3 BACK PANEL CONNECTIONS
- 2.4 MODE OF OPERATION

3.0 SUMMARY OF AT COMMANDS
- 3.1 COMMANDS
- 3.2 FACTORY DEFAULTS

4.0 EXTENDED HAYES/LIMA FEATURES
- 4.1 SECURITY CALLBACK
- 4.2 SECURITY CALLBACK COMMANDS
- 4.3 USER DEFINABLE HAYES COMMANDS
- 4.4 REMOTE CONTROL
- 4.5 USING STORED NUMBERS IN HAYES MODE
- 4.6 MODEM STATISTICS

5.0 GENERAL INFORMATION
- 5.1 CCITT V.32
- 5.2 V.32 STARTUP SEQUENCE
- 5.3 RETRAIN PROCEDURE
- 5.4 SYNCHRONOUS/ASYCHRONOUS
- 5.5 INTERWORKING AT V.22bis; (2400 bits/s)

APPENDIX A TECHNICAL INFORMATION

APPENDIX B SERIAL DATA PORTS

APPENDIX C CONDITIONS OF USE

1.0 INTRODUCTION TO THE LIMA 5000 SERIES MODEMS

These are a range of multimode modems which will provide 2 wire full duplex operation from 300bps to 9600bps. The modems can be controlled by Hayes command, Lima menu, or by Lima script file to give total automatic control.

The Modem Range

The modems share many of the same features:

The LIMA 5000, is a four speed (V.21,V.23, V22 and V.22bis) modem which has a dial up interface. The modem can be used to provide a secure dial back service for synchronous and asynchronous applications. The Lima script option allows complete control of the modem interface and functions.

The LIMA 5032, is a multimode modem which can operate up to a line speed of 9600bps in synchronous and asynchronous applications. Error free asynchronous throughput may be increased by using the MNP5 data compression, this can give a data throughput up to twice the line speed. The Lima script option allows complete control of the modem interface and functions.

1.1 FEATURES

- Synchronous or asynchronous transmission on the Serial Interface.
- 2 wire leased line operation with 2 wire manual dial back up should the leased line fail
- Automatic speed sense on the line interface
- Auxiliary control ports
- Extended Hayes command set
- Powerful Lima script language
- Enhanced user control of the RS232 Signals
- Front panel software control
- Hayes compatible interface
- V42 Error correction + MNP level 5
- Autoanswer
- V25bis autodial
- Remote and local line loop test
- Remote configuration

1.2 MODES OF OPERATION

CCITT Standard	Line Speed	Full/Half Duplex	LIMA 5000	LIMA 5032
V21	300/300	FD	*	*
V22	1200/1200	FD	*	*
	600/600	FD	*	*
V23	1200/75	FD	*	*
	75/1200	FD	*	*
	600/75	FD	*	*
	75/600	FD	*	*
	1200/1200	HD	*	*
V22bis	2400/2400	FD	*	*
V26bis	2400/2400	HD		*
V.27ter	4800/4800	HD		*
V.29	9600/9600	HD		*
V32	4800/4800	FD		*
	9600/9600	FD		*
	9600/9600	TCM FD		*
V25			*	*
V25bis			*	*
V42 + MNP5			*	*
V54			*	*

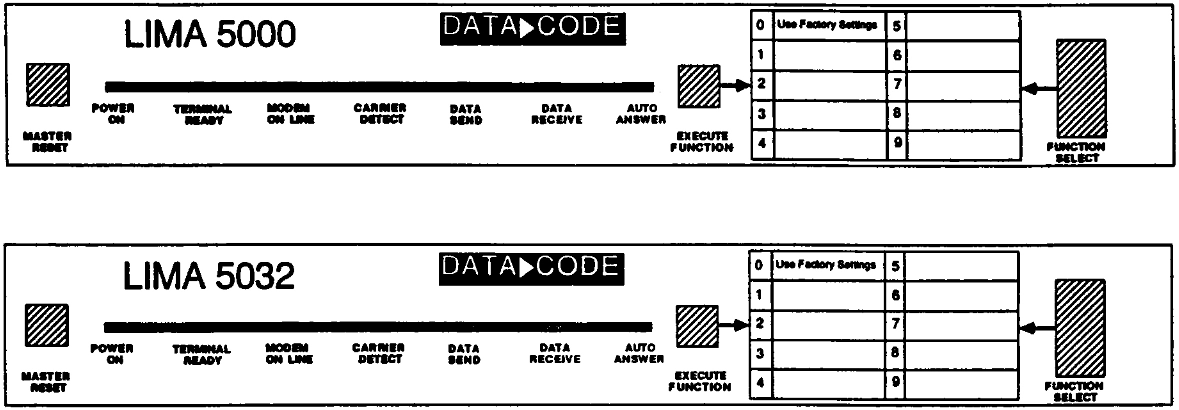


Diagram (1) Lima 5000 and 5032 Front Panels

2.0 INDICATORS AND CONNECTIONS

2.1 THE FRONT PANEL INDICATORS

The LIMA 5000 Series Modems have seven LED indicators, these have the following meaning when lit:

POWER ON	Power has been supplied to the modem.
TERMINAL READY	Data Terminal Ready (DTR) has been provided by the attached terminal device.
MODEM ON LINE	Modem has gone online.
CARRIER DETECT	The modem has detected a valid carrier signal from a remote modem.
DATA SEND	Flashes when data is being transmitted.
DATA RECEIVE	Flashes when data is being received.
AUTO ANSWER	If it is flashing; the modem requires "AT" to detect the terminal interface and character length and parity. If it is on solid, then the modem will autoanswer an incoming call, unless the facility has been disabled.

2.2 FRONT PANEL PUSH BUTTONS

There are two push button switches on the front panel and these are described below:

MASTER RESET	In the event of the modem being unable to communicate with the terminal device, then by selecting function 0 on the Function Select display and pressing Master Reset, the factory configuration will be loaded. No script is executed in this case, and the baud rate detection is set to 'automatic'.
EXECUTE FUNCTION	Executes the script (if programmed) selected by the Function Select Switch.

2.3 BACK PANEL CONNECTIONS

The LIMA 5000 Series Modems have three serial ports. One is a standard V.24 (RS232C) digital serial data port, the other two are auxiliary control ports. The auxiliary ports can be used for Network Management control of the modems or as input/output alarm ports.

UK MODEL ONLY:

The arrangement of the telephone sockets and the use of the flying telephone leads for line connection will depend on the model number, please refer to the appropriate back panel diagram.

INTERNATIONAL MODEL ONLY:

The Lima has two RJ11/C type telephone sockets. Either of these may be used for the connection of a telephone to the Lima and the other for connecting the Lima to an RJ11 style telephone line wall socket (Using a suitable cable). Please note the marking on the line cord and connect to the appropriate socket.

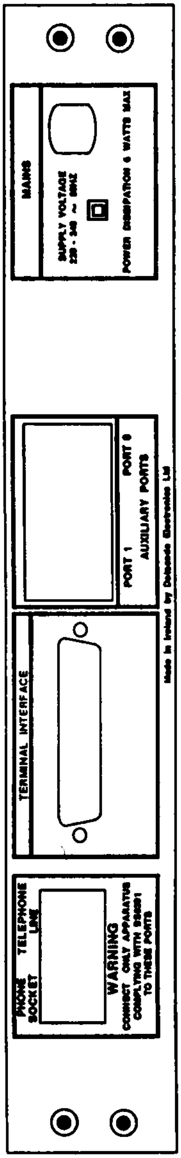


Diagram (2) Back Panel Connections International Model

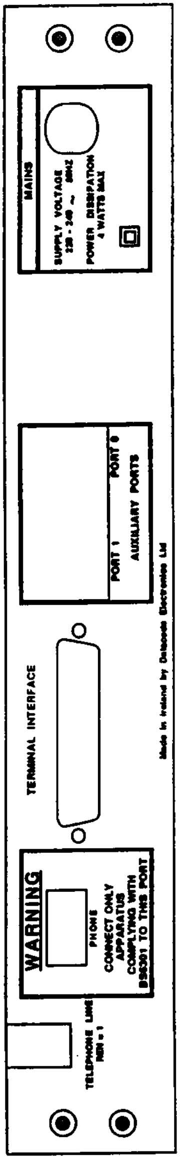


Diagram (3) Back Panel Connections UK Model

2.4 MODE OF OPERATION

The modem will function in Hayes command mode or in Lima menu mode. The operational mode will depend initially on the position of the LIMA FUNCTION SWITCH

FUNCTION SWITCH SETTING

FUNCTION 0 On power on, or if the MASTER RESET BUTTON is selected, the modem will load the factory default settings. It will function in the Lima menu mode. You must type "**A**" followed by carriage return to get:

```
  Lima 5032 v7.0.1.40
(C) 1988 DATACODE Electronics
A  Terminal set up or Enter new service
+  Extra services

Which service? (? for help)
```

FUNCTION 1 to 9 On power on, or if the MASTER RESET BUTTON is selected, the modem will load the user settings with the "ATZ" command, this may be the factory default settings if they have been stored with the "AT&W" command. It will function in the Hayes mode. You must type "**AT**" followed by carriage return to get the Hayes prompt "**OK**".

NOTE: The action the modem will take for function switch settings between 1 and 9 can be script controlled, a script may change the operational mode of the modem.

3.0 SUMMARY OF AT COMMANDS

To give any of these commands to the Lima, type "AT" or "at" followed by the commands, and hit RETURN. Spaces can be used anywhere after the "AT". Where a command uses a number to select one of several options, if no number is entered this is the same as using zero. e.g. these commands are all the same

```
AT B F3
ATBF3
at b 0 f 3
```

Note that these are not valid:

```
a t b f3        (space between a and t)
at 3 f3         (no command before number)
```

In general, any commands can be freely mixed on one line. The exceptions are: A, D and O. After D the only commands allowed are only digits to dial and dialling commands which are listed with the D command below. Any commands after A and O on the same line will be ignored.

3.1 COMMANDS

+++ Escape code (factory default)

The modem will go into command mode. There must be a silent period at the beginning and end of the escape command sequence or the command will be ignored. The code may be changed (see S-Register S2)

AT Attention (prefix to commands)

The modem should normally respond with OK if the function select switch is **NOT** set to 0

A Answer

Makes the Lima go online in answer mode

B Bell/CCITT

0	CCITT full duplex
1	Bell full duplex
2	CCITT half duplex
3	Bell half duplex

This command is for compatibility only, the use of this command is not recommended. To set the line mode, use S-register 13, to set half/full duplex, use *H.

D Dial

Makes the Lima go online, dial a number and attempt to connect in originate mode. The rest of the command line is interpreted as follows:

0,1,2,3,4,5,6,7,8,9,*,# digit to dial (note * and # are DTMF only)

T	switch to DTMF (tone) dialling
P	switch to pulse dialling
,	pause for the time given in S-register 8
W	wait for dial tone
!	hook flash (hang up for 0.5 second)
R	use answer mode instead of originate mode
;	when connection is established, wait for further commands
~	wait for 2 rings
Nn	dial stored number n
S	redial last stored number

Any other characters are ignored.

E Echo

0	Don't echo commands
1	Echo commands

F Set line speed

	CCITT	**Bell**
0	automatic	automatic
1	V.21	Bell 103
2	V.22 (600/600)	V.22 (600/600)
3	V.23	V.23
4	V.22 (1200/1200)	Bell 212
5	V.22 bis	V.22 bis

This command is for compatibility only, it is recommended that S-register 13 is used to set the line standard.

H Hangup

0	hang up
1	seize line

I Identity

0	print S-register 38
1	print 021 <newline> 198
2	no effect
3	print 004

This command is provided for compatibility only. The values printed have no meaning.

K Report Statistics

Reports about the last call, and the total number of calls made.

L **Set Speaker Volume**

Values 0,1,2,3 are accepted but will not have any effect.

M **Speaker Action**

0	off
1	on until connection established
2	on always

O **Online**

0	resume call (interruped by +++ for example)
1	resume call and retrain

Only V.22bis and higher speed standards allow for retrain.

P **Select Pulse Dialling**

Selects a default of pulse dialling for all subsequent calls

Q **Quiet**

0	produce report codes
1	do not report

S **Select S-register**

Values 0 to 255 are allowed which select the current S-register, this is the register which will be read by ? or written by =

T **Select Tone Dialling**

Selects tone dialling as the default for all subsequent calls

V Verbose

0 report using numeric codes
1 report using text codes

The value 0 is allowed for compatibility only. It is recommended that applications always use text responses.

X Select Report Detail

	detect dial tone	report speed
0	N	N
1	N	Y
2	Y	Y
3	N	Y
4	Y	Y
5	N	Y
6	Y	Y

Z Reset

0 restore user settings saved with the &W command
1 restore user settings saved with the &W1 command

Restores all settings as if the modem had been switched off and on again.

&C Set DCD/DSR

0 force DCD and DSR on
1 control DCD and DSR as in CCITT recommendation

&D DTR options

0	ignore DTR
1	dropping DTR allows modem to command mode, modem stays online
2	circuit 108.2, if DTR is low modem will not dial or answer a call, if DTR goes low when the modem is online the call will be disconnected
3	the transition of DTR from high to low will reset the modem

&E MNP Error Correction

0	off
1	allow MNP (turn off if remote does not use MNP)
2	require MNP (fail with LINK FAILURE error if remote does not use MNP)

&F Use Factory Settings

Changes all settings to the value set in the factory

&I Fixed Speed to Terminal

0	make speed to terminal follow line speed
1	fix speed to terminal, CONNECT reports line speed
2	fix speed to terminal, CONNECT reports terminal speed

&K Flow Control to Terminal

0	none
1	xon/xoff
2	CTS
3	xon/xoff and CTS

&L Leased Line

0	dial-up, (sets the line transmission level to -9dBm)
1	leased line, (sets the line transmission level to -13dBm)

&M Synchronous/asynchronous Mode

0	async
1	sync
2	sync
3	sync

&R RTS/CTS

0	CTS follows RTS
1	CTS forced on

&S DSR Control

0	force on
1	control DSR as in CCITT recommendation

&T Test

0	stop all tests
1	start local analogue loop (V.54 loop 3)
2	no effect
3	no effect
4	no effect
5	no effect
6	request remote loop (V.54 loop 2)
7	request remote loop, send and check test pattern
8	start local loop, send and check test pattern

&U Flow Control from Modem

0	none
1	xon/xoff
2	xon/xoff
3	RTS
4	RTS and xon/xoff

&V Command Mode

0	normal
1	disable escape sequence
2	enter dumb mode

&W Save Configuration

0	save current setting, values are used on power up or can be recalled by the ATZ command
1	save current setting, values can be recalled by the ATZ1 command

&X Clock Source

0	internal
1	external
2	slaved from receive

&Zn Store a number, where n is the number to be stored

Eg. **AT N10 &Z T012345678**, this stores the telephone number 012345678 in memory location N10. When the number is dialled the modem will use tone dialling.

The stored number in location N10 may be deleted by using the command ATN10&Z

***C Show Current Configuration**

the values of all settings are displayed

***F Line Flow Control**

0	disable
1	xon/xoff

***G Calling Tone**

0	disable
1	enable

***H Half Duplex**

0	disable half duplex
1	enable half duplex

***P Pseudo Half Duplex (V.32 and V.32bis only)**

0	disable
1	enable

***S List S-Registers**

Lists all S-registers with their values in hex and decimal

***X V.24 Clocks**

0	on in synchronous data mode
1	on always

% Go to LIMA MENU

%C MNP Level 5 Compression

0	disable
1	enable

S-REGISTERS

0	Number of rings to auto-answer on, don't answer if zero.
1	(Read only) number of rings counted. This is cleared when 8 seconds elapse with no ringing
2	Escape character
3	CR character (used on input to determine the end of a command, and on output in response codes).
4	LF character, used in text responses
5	BS character (used in input to erase part of a line)
6	Time to wait for dial tone
7	Maximum time to wait for carrier
8	Time that comma pauses for when dialling
10	Maximum loss of carrier before hangup
11	Length of DTMF tones and inter-digit delay when tone dialling
12	Escape code guard time

13 **Line Standard**

0	Automatic
2	V.21 (300/300)
4	V.23 (1200/75)
6	V.23 (600/75)
8	V.22 (1200/1200)
10	V.22 (600/600)
12	Bell103 (300/300)
14	Bell212 (1200/1200)
16	V.22bis (2400/2400)
18	V.32 (4800/4800)
20	not used
22	V.32 (9600/9600)
24	V.32 TCM (9600/9600)
26	not used
28	V.26bis (1200)
30	V.26bis (2400)
32	V.27ter (2400)
34	V.27ter (4800)
36	V.29 (4800)
38	V.29 (7200)
40	V.29 (9600)
42	V.32bis TCM (7200/7200)
44	V.32bis TCM (12000/12000)
46	V.32bis TCM (14400/14400)

14 Bit mapped options
[see note 1]

18 Test timer (for self-tests)

21 Bit mapped options
[see note 1]

22 Bit mapped options
[see note 1]

26	RTS to CTS delay
27	Bit mapped options [see note 1]
37	Watchdog timer
38	Value returned by ATI
39	Xoff character (read only)
40	Xon character (read only)

NOTE:

1. This is provided for compatibility only, it is strongly recommended that it not be used. In particular no guarantee is made that:

    a) reading the value gives a full representation of the status

    b) writing the value back will restore the modem's setting

2. **Size of S-Registers**

    These are defined to be bytes (i.e. hold 0..255). This means that time values are all held in different units. By making S-registers hold a wider range of values, and allow '.' in a value all times could be expressed in seconds (the Lima does this except when in AT mode).

3.2 FACTORY DEFAULTS

```
at*c
Handshake:
CTS flow control: on
RTS flow control: on
Hayes: on
No local echo: on
ATE: 1
ATV: 1
Await echo of CR: off
MNP5 compression: on
Pseudo carrier: off
Leased line: off
ATQ: 0
ATX: 2
Answer/originate: ori
Standard: Automatic
Escape character (S2): + (43)
Escape guard time (S12): 1 second
Time to wait for answer: 40 seconds
Line length for word wrap: 0
"+ring action": enabled
List script as it runs: off
DTR resets modem: off
Allow remote control: on
Maximum loss of carrier: 0.50 seconds
Maximum idle time: 900 seconds
BS -> DEL: off
DEL -> BS: off
Teletext terminal: off
Send CRLF as CR: off
Print CR as CRLF: off
DTR flow control: off
Await echo: off
Pass characters to terminal: on
Length of dial tone: 1.50 seconds
Time to wait for dial tone: 10 seconds
S0 (auto-answer): 1
S6 (blind dial delay): 5
DTMF duration (mS): 74
Speaker on: during dialling
S8 (comma time): 1
S4 (LF): %J (10)
S5 (BS): %H (8)
S38 (ATI): 220
MNP: off
Half Duplex: off
No answer tone: off
```

```
Send RTS via MNP: off
Calling tone: on
Pass CTS: on
Pass DSR: off
Pass DCD: off
Pass RI: on
DTR is 108: on
Pass RTS: off
DTR enters command mode: off
Pass TEST: off
CTS: off
DSR: on
DCD: on
RI: on
TEST: off
Bit-transparent mode: off
AT&X: 0
AT&I: 1
AT&V: 0
AT*X: 0
RTS action: enabled
aux0 RTS action: enabled
DTR action: disabled
aux1 RTS action: enabled
RTS/CTS delay (mS): 20
S18: 0
usesc: 0
Terminal speed: 9600
versions: 0A01.33
Dialling prefix:
Space free: 84%

OK
```

4.0 EXTENDED HAYES/LIMA FEATURES

Extended Hayes commands are introduced by a minus sign (-) and have names that are several letters long. They can appear in the middle of a normal Hayes command line. To list the available extended commands, do "**AT-?**".

Each extended command follows the same general form. Typing the command name followed by "=?" explains how to use the command. Entering the command name followed by "?" shows the current value of the setting it controls. The command itself will be followed by "=", parameters separated by commas, and a final ";".

AT-TSPEED=????;   (???? = baud rate of RS232 interface)

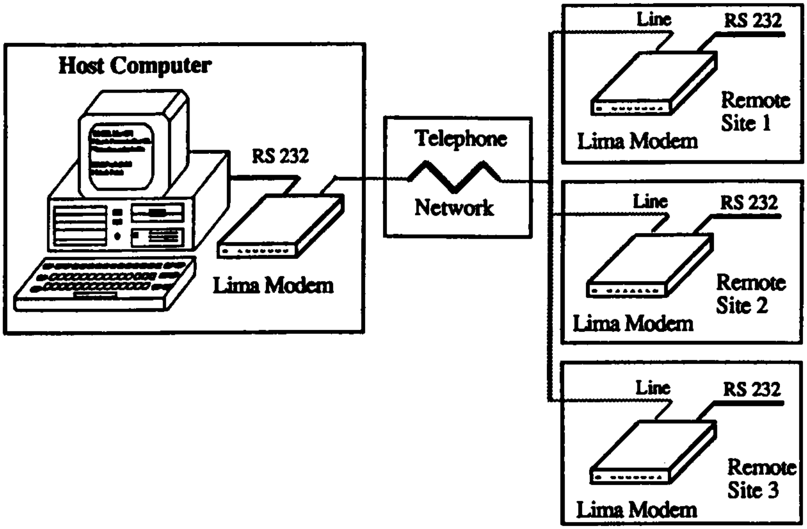
This extended Hayes command can be used if the remote terminal device cannot provide commands to the modem's serial port to set the port speed. A good example for the use of this command would be if the modem was connected to a serial printer.

AT-TSPEED=9600;   would set the modem's serial interface to 9600 bps.

4.1 SECURITY CALLBACK

When Security Callback is enabled, an incoming caller will be presented with a menu of known usernames from the directory. The caller must select one of these usernames and the correct password associated with it before proceeding. Note that the password must match exactly the one in the directory, including the case of letters. The characters in the password are not echoed as they are typed.

If the username has a callback number, the modem will hang up after printing "Calling you back", and will then dial the callback number. If the username has no callback number, the answering modem will establish the connection as usual.



If a Lima modem is used at both ends of the link, the system may be used for sycnchronous, or asynchronous applications . Further enhancements can be made to the setup if the Lima's scripting ability is used.

The Lima modem is extremely easy to set up for this application using extended Hayes commands:

4.2 SECURITY CALLBACK COMMANDS

-SC: change Security Callback directory. There are three variations:

1. **AT-SC="username";**
   Deletes `username' from the directory. If there was no entry for `username', nothing happens.

2. **AT-SC="username", "password", "";**
   Adds or replaces an entry for `username' to the directory, with password `password' and no callback number.

3. **AT-SC="username", "password", "number";**
   Adds or replaces an entry for ‘username' to the directory, with password ‘password' and callback number ‘number'.

-USESC: enable or disable Security Callback. There are two possibilities:

1. **AT-USESC=0;**
   Disable Security Callback. The directory remains intact but will not be used until Security Callback is re-enabled.

2. **AT-USESC=1;**
   Enable Security Callback. Incoming callers must supply a correct password before they can use the modem.

For instance, suppose the following commands have been given:

```
AT-SC="user1", "apassword", "";
AT-SC="user2", "bpassword", "";
AT-SC="fred", "jim", "t9w123123";
AT-USESC=1;
```

Entering the command "AT-SC?" now will produce this display:

```
-SC="user1", "apassword", "";
-SC="user2", "bpassword", "";
-SC="fred", "jim", "t9w123123";
```

An incoming caller will be presented with this menu:

```
Choose from the list
A0 user1
A1 user2
A2 fred
```

If the caller types "a0", this prompt is displayed:
Enter password for user1:

The caller must type "apassword" to continue. The modem will display:
You are now connected..., and the call may proceed.

If the wrong password is given, the modem will display:
Password incorrect....., and hang up.

If the caller selects "a2" and types the correct password, the modem will display:
Calling you back....., and hang up the line.

The caller's modem should also hang up when it notices the loss of carrier. Assuming the callback number is correct and the modem is configured correctly to answer, it will be called back and will answer.

The remote modem will now display:
You are now connected...., and as before the call may proceed.

4.3 USER DEFINABLE HAYES COMMANDS

The facility has been added to allow the user to define exactly what a Hayes command does. You can now create a script, or scripts, that will be executed instead of any given Hayes command. This is of most benefit when your communications software sends Hayes commands that you would like to override.

Example:

The following example has no real use but it should convey the versitility of this feature. Using the Lima menu create a script named "+ATHELLO"

```
+ATHELLO
1 Write line to screen: Hello this is your Lima
2 Pause 1 second
```

The Lima script shown above will display "Hello this is your Lima" every time you use the Hayes command "ATHELLO". This command will be accepted and executed as if it were a standard Hayes command. The new command can be added into a string of Hayes commands eg. "AT&C1&D0HELLO".

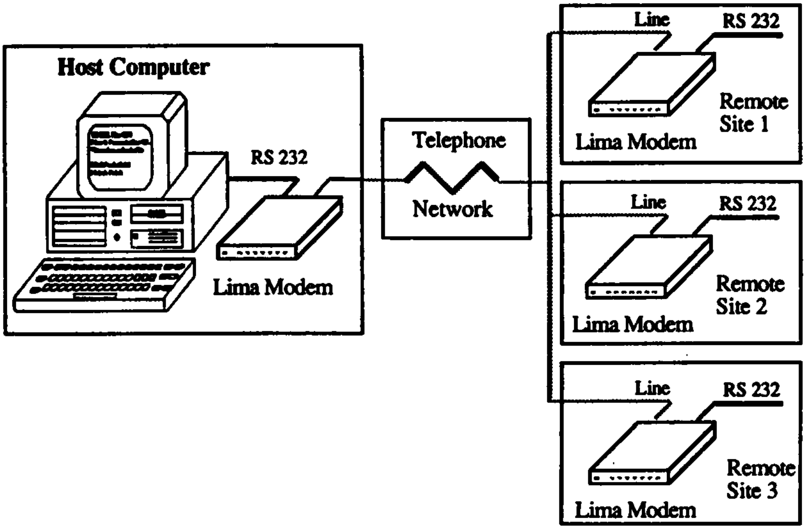
USE OF THIS FEATURE

The example given above is of no real practical use. However, the Lima scripts can completely control the Lima modem, by creating a Lima "+ATcommand" script it is possible to log onto a computer system, compete file transfers etc. This can be done all under modem control, actioned using one Hayes command.

The script "+ATcommand" will be executed in preference to any standard Hayes command of the same name ie. the script named "+ATZ", if it was in the Lima script menu, would be executed in preference to the Hayes command "ATZ".

4.4 REMOTE CONTROL

This feature allows a Lima to be configured through a dialup connection. With a setup like the one illustrated below, both of the modems can be configured from either site. This facility is particularly useful when equipment is to be installed some time before it is configured. It also allows the configuration to be checked and changed without requiring anyone to be at the remote site.



TO USE

Dial up the Lima you want to control. When the connection has been established, type **+++** to get to the on-line command mode, this will give, depending on the mode the local modem has been set to, the Lima menu or the Hayes **OK** prompt. If the modem is set to Hayes modem you must use the command **AT%** to first get to the Lima menu. Using the Lima menu select the command "Request remote control", (the command menu prompts will be AMR). The local Lima will then send a request to the remote modem. The remote modem will respond by asking for the remote control password, this will be **separiffic** unless changed by the user. If the password is accepted by the remote modem it will tell you that remote control is active.

When remote control is activated the Lima will behave exactly as if you were directly connected to it's serial port. You will get a menu, or if the Lima is in Hayes mode it will be waiting for an "AT" command. When you have examined and modified the configuration as necessary you can either simply hang up, or give the command "ATO" ("Data link" from the Lima menu) after which you are connected through to the remote modem just as if you were starting a normal call.

4.5 USING STORED NUMBERS IN HAYES MODE

There can be up to 100 stored numbers, called N0 to N99. To add store the number T1234 as N10, use the command "ATN10&ZT1234".

To show the current value of N10, use "ATN10?". To delete N10, use "ATN10&Z" (i.e., store an empty number there).

Stored numbers can be accessed by name in a dial string. For instance, the command "ATDN10" will dial the number in N10. The digits stored there will be displayed as they are dialled. A stored number can be referenced anywhere in a dial string, for instance as in "ATDT9WN10W123" which will tone dial 9, wait for a dial tone, dial the contents of N10 (T1234), wait for a second dial tone, then dial 123. It is an error to refer to N10 when no number is stored there; dialling will be aborted with the message ERROR. For compatibility with other modems, the character S may be used in a dial string to dial whatever stored number was referred to last.

To examine the current value of a stored number, use a command like "ATN10?". This will produce an output like "Dial number: %T1234;". This means that the number T1234 is stored in N10. If there is no number stored in N10, "ATN10?" will produce no output.

DTR dialling can be enabled with the command AT*D1, and disabled with AT*D0. When it is enabled, stored number N0 will be dialled when DTR is turned on in Hayes mode. A number must have been stored there previously, or the message ERROR will be displayed.

IMPLEMENTATION

Stored numbers are kept as scripts with names of the form "+Dial Nnn"; for instance N10 is stored as "+Dial N10", N9 as "+Dial N09". Each such script contains a command like "Dial number: %T1234;". The leading % indicates dialling continuation, so that the modem will not try to wait for dialtone again (it will already have done that at the D in ATDN10). The trailing ; prevents the modem from trying to handshake when it finishes dialling the digits.

DTR dialling is done by a built-in "+Hayes DTR action" script which contains the command "Dial number: N0". The command AT*D simply enables or disables DTR action scripts.

4.6 MODEM STATISTICS

The following is an example of the screen printed when you execute the Lima menu "Show modem statistics" command, or use the Hayes command ATK

```
Number of calls: 50
Characters received: 108
Characters sent: 100
Terminal overruns: 0
Line overruns: 0
MNP retries: 0
Time connected (seconds): 50.89
```

5.0 GENERAL INFORMATION

5.1 CCITT V.32

A V.32 modem using Quadrature Amplitude Modulation (QAM) modulates data at (synchronous) data signalling rates of 9600 or 4800 bits/s.

V.32 has two alternative modulation schemes one using sixteen carrier states and the other using Trellis Coded Modulation (TCM) with thirty two carrier states.

TCM is used to improve data reliability when using V.32 9600/9600 bps. V.32 can transmit up to 9600 bits per second but has a *baud* rate of 2400 baud.

5.2 V.32 STARTUP SEQUENCE

The V.32 startup sequence is used by two modems using V.32 to establish the most efficient line speed they can both use, ie. on starting a call the Lima will wait to receive a "receiver conditioning signal" from the remote modem. This signal contains information on what line speeds are available and if trellis coding is available. The Lima will then start transmission based on that information provided by the answering modem.

5.3 RETRAIN PROCEDURE

During data transmission if the Lima realizes that the signal reception is unsatisfactory or if the remote modem informs the Lima that it finds the signal reception unsatisfactory both modems will start a "retrain" sequence. This is a conversation that takes place between the two modems (invisible to the user, similar to the start up procedure) to decide on what line speed and coding methods to use to get the best results.

The retrain procedure can be initiated manually by the user. Note the retraining procedure can only be used with V.22 bis and V.32. The command is called "Retrain" and is in the Specialized line control menu. This command tells the modems to re-examine the line quality and attempt to adapt to any changes since the connection started.

5.4 SYNCHRONOUS/ASYCHRONOUS

The Lima uses asynchronous communication to the terminal or computer when it is presenting menus and receiving commands. The default mode for communication with the remote modem is asynchronous. When the Lima is set to synchronous mode, it uses synchronous mode to transfer data between the terminal and the remote modem. Synchronousmode cannot be used to give commands to the Lima

5.5 INTERWORKING AT V.22bis2400 bits/s)

When the V.24 signal on the Lima are set to "pass through" and the current line standard is set to V.22bis, the V.24 signal will operate as set down in the CCITT Recommendation for V.22bis.

This is a very brief description of how the circuit or signals operate. More detailed information about the CCITT recommended operation of these signals is outside the range of this manual. Further details of the functions of the V.24 signals can be found by reading the relevant CCITT documentation.

DTR will operate as circuit 108/1 or circuit 108/2.

NOTE:	CTS	is circuit 106
	RTS	is circuit 105
	DSR	is circuit 107
	TEST	is circuit 142

When the Lima is using the originate mode.

-Initially DSR is off.

-The Lima goes on line using the originate mode and listens for the V.25 Answer Tone while sending the calling tone.

-After receiving the Answer Tone the Lima will assert DSR.

-When the V.25 handshake sequence is complete, the Lima will condition CTS to respond to RTS.

-The modem is now ready to start data transmission.

When the Lima is using the Answer mode.

-Initially DSR is off.

-The Lima goes on line using the answer mode and transmits the

V.25 Answer Tone.

-The Lima asserts DSR.

-When the V.25 handshake sequence is complete, the Lima will condition CTS to respond to RTS.

-The modem is now ready to start data transmission.

APPENDIX A

TECHNICAL INFORMATION

DIGITAL (SERIAL) INTERFACE

Connector:	25-way Cannon 'D'.
Type:	RS-232C V.24 Compatible.
Gender :	Female.

AUXILIARY CONTROL PORTS (0 and 1)

Connector :	5-way Domino.
Type:	Undefined (DCE / DTE).
Gender :	Female.

LINE INTERFACE

UK Model	4-way flexible line cord type BT4/502 to BT specifications CW1311. Connection arrangements no. 1 to BS6789 Section 6.1 Clause 6.2.
International Model	4-way RJ11 style modular socket.

PHONE INTERFACE

UK Model	4-way British Telecom Socket Type BT603A. Voltage drop from line cord to this socket is between 0.3 and 0.4 volts.
International Model	4-way Modular Plug to Plug cable

PULSE DIALLING

10 Pulses per second.
66% Duty Cycle.

TONE DIALLING

DTMF to CEPT standards

RING EQUIVALENCE NUMBER (REN)

REN = 1.

POWER REQUIREMENTS (*)

Voltage **200-250** Volts AC.
Frequency 45-65 Hz.
Power Dissipation 6 Watts Max.

Voltage **48** Volts DC.
Power Dissipation 6 Watts Max.

Voltage **24** Volts DC.
Power Dissipation 6 Watts Max.

Voltage 12 Volts DC.
Power Dissipation 6 Watts Max.

(*) depends on the model

WEIGHT (unpackaged)

2 Kg

APPENDIX B

SERIAL DATA PORTS

V.24 SERIAL PORT

The standard serial port or Terminal interface on the Lima is an V.24 / RS-232C type port and uses a 25 way cannon 'D' socket.

This serial (digital) interface is capable of using two data communication modes:

1. 7/8 bit Asynchronous communications.
2. Synchronous communications.

Pin		Function	Direction
2	TX	Transmit Data	To Lima
3	RX	Receive Data	From Lima
4	RTS	Request To Send	To Lima
5	CTS	Clear To Send	From Lima
6	DSR	Data Set Ready	From Lima
7	GND	Ground	---------
8	DCD	Data Carrier Detect	From Lima
15	TC	Transmit Clock	From Lima
17	RC	Receive Clock	From Lima
20	DTR	Terminal Ready	To Lima
22	RI	Ring Indicator	From Lima
24	TC	Transmit Clock	To Lima
25	TEST	Test	From Lima

DESCRIPTION OF V.24 SIGNALS

Transmit Data (Pin 2)

Data transmitted from the terminal to the Lima.

Receive Data (Pin 3)
Data transmitted to the terminal.

Request To Send (Pin 4)
The terminal should raise this signal before transmitting data.

Clear To Send (Pin 5)
The Lima will raise this signal to the terminal it is ready for data to be sent to it.

Data Set Ready (Pin 6)
This raised by the Lima when it is powered up and connected to line.

Signal Ground (Pin 7)
The reference point for the other signal levels (zero volts)

Data Carrier Detect (Pin 8)
Raised by the modem when the modem has detected a valid carrier signal.

Transmit Clock (Pin 15) Transmitted data clock. (Output)
Used for Synchronous applications when in bit transparent mode.

Receive Clock (Pin 17) Received Data Clock. (Output)
Used for Synchronous applications when in bit-transparent mode.

DTR (Pin 20) V.24 circuit 108/1 and circuit 108/2

The Lima can be instructed to use DTR as CCITT V.24 circuit 108/1 or CCITT V.24 circuit 108/2.

Circuit 108/1 operation:
In this mode the Lima will go online using answer or originate modes if DTR is active and go off line (hang up) if DTR is inactive. This is achieved by enabling DTR as circuit 108 and by setting up a script called "+DTR action". This script should contain an answer, dial or originate command followed by the "data link" command.

Circuit 108/2 operation:
In this mode the Lima will only attempt to go on line or dial if DTR is active and will go off line (hangup) if DTR in inactive. This is achieved by enabling DTR as circuit 108 (this is the default setting).

Ring Indicator (Pin 22)
This signal follows the ringing of an incoming call.

Transmit Clock (Pin 24)
External Transmitted data Clock. (Input)
Used for synchronous applications when in bit-transparent mode.

Test (Pin 25)
This is an output signal and the status of this line is completely under the control of the user.

AUXILIARY CONTROL PORTS

The Lima has two auxiliary control ports which are labeled Port 0 and Port 1.

Pin	Function	Direction
1	Ground	<->
2	TX Transmit Data	From Lima
3	Flow Control	To Lima
4	RX Receive Data	To Lima
5	Flow Control	From Lima

Both ports use 5 way Domino connectors and have the same pin outs and function.

One advantage in using this type of connector is that you can select either a DTE or DCE configuration by rotating the connector through 180 degrees.

APPENDIX C

CONDITIONS OF USE

Users should note the following:

a) This equipment is **approved** for connection to BT, Hull and Mercury Private Leased Lines and Public Switched Telephone Network.

b) This modem provides these additional features:

- Loop-disconnect and MF dialling
- Detection of Initial Proceed Indication
- Operation in absence of Indication
- Detection of secondary proceed indication
- Automatic dialling
- Tone detection i.e. Ring, Busy, Equipment Engaged, Number unobtainable
- Auto clear from the originating end
- Repeat of last number dialled

Full instructions for the use of the dialling facilities are contained in Section 2

c) Only devices approved to BS6301 may be connected to the port marked **Phone.** Connection of this port to ports not marked in an identical manner may produce hazardous conditions on the network. Advice from a competent engineer should be obtained before making such a connection.

d) The **REN** number relates to the ring performance when used in combination with other items of apparatus. The **REN** value is a guide to the approximate maximum number of items of apparatus that may be connected simultaneously. The total **REN** value is the sum of the individual **REN** numbers and should not exceed 4. This unit has a **REN** number of 1 and a standard bell is assumed to have a value of 1.

e) This unit is not suitable as an extension to a payphone, shared service lines, or 1 + 1 carrier systems.

f) The approval of this modem for connection the the British Telecom public switched telephone network is **INVALIDATED** if the apparatus is subject to any modification in any material way not authorised by BABT or it is used with or connected to.

i) internal software that has not been formally accepted by BABT

or

ii) external control software or external control apparatus which causes the operation of the modem or associated call set-up equipment to contravene the requirements of the standard set out in BABT/SITS/82/005S/D or 82/01/C.

All apparatus connected to this modem and thereby connected directly or indirectly to the British Telecom public switched telephone network must be approved apparatus as defined in Section 22 of the British Telecommunications Act l984.

USED WITH LEASED LINE CONNECTION

a) This unit is suitable for point to point circuits only. The modem is not suitable for use with signalling at 2290Hz. The unit does not require signalling or make any use of frequency 0-200Hz.

b) Connection to private circuits is made using a standard new style jack with connection between pins 1 and 6 via a hard wired connection.

c) There is no requirement or intention for d.c. interaction between the apparatus and the Unit. A d.c. unpowered path presenting a high a.c. impedance is applicable.

d) Under no circumstances should the unit be connected to a private wire circuit while configured for PSTN. See Section 1 for PSTN/Leased Line selection.

DATA CODE